

Clayton Power

G3 Combi and Inverter User Manual

Models: 1012-50, 1312-80, 1512-80, 2012-100, 1024-30, 1524-40, 2324-50, 1012,
1312, 1512, 2012, 1024, 1524, 2324

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Compliance

The G3 Inverter and Combi comply with the following standards:

2006/95/EC	(Low voltage directive)
EN62040-2/2006	(UPS standard)
EN55022/2006 Class B	(Emission and Immunity)
EN60950-1/2006	(Safety standard)
E13 – 10R-03 9803	(Automotive)
RoHS	

Warranty

Installation, operation, technical support, warranty and service issues should initially be directed towards the outlet at which you purchased your Clayton Power Product.

Caution and warning:

DO NOT USE OR ATTEMPT TO USE THIS PRODUCT UNTIL YOU HAVE READ THIS USER MANUAL IN ITS ENTIRETY!

IMPROPER INSTALLATION OR USE OF THIS DEVICE MAY BE HAZARDOUS AND MAY CAUSE DAMAGE TO OTHER ELECTRICAL EQUIPMENT AND WILL VOID THE WARRANTY!

Clayton Power warrants to the original purchaser only for a period of 24 months from the date of purchase, that the Clayton Power product will be in good working order when properly installed and operated as described in this manual.

If the inverter fails within this period under normal use, Clayton Power will, without charge, at the place of Clayton Powers choosing, repair or replace the inverter – with new or reconditioned parts or a new or reconditioned product of same model/type as Clayton Power deems necessary.

This warranty is void and will not be applied if:

- The inverter has been used against the recommendations of this manual.
- The inverter has been used in an application outside of general automotive, solar, industrial or marine applications without the agreement of Clayton Power.
- The inverter has been modified or repaired without written authorization of Clayton Power.
- Reverse polarity, excessive overloading, general abuse, neglect, wear & tear, ingress of liquids (water, oil, acid, or otherwise), foreign objects, lightning strikes, over or under voltage, RFI/EMI, etc.

Obtaining Warranty Service

To obtain warranty service, please contact the outlet at which you purchased your product. Do not contact Clayton Power directly. For warranty service you will require the following:

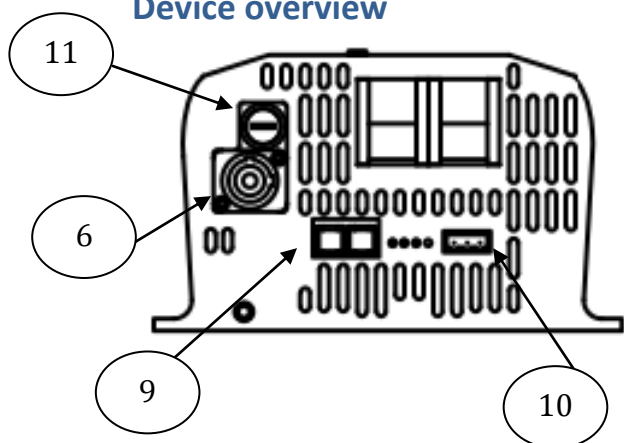
1. Proof of purchase
2. Model number
3. Serial number
4. Brief description of application and problem Telephone your Clayton Power dealer for an authorization number prior to dispatch - do not send without authorization. Once this number has been obtained, please carefully package your inverter and send (freight paid) to the Clayton Power dealer.

General precautions

When working with batteries always ensure that no short circuits occurs.

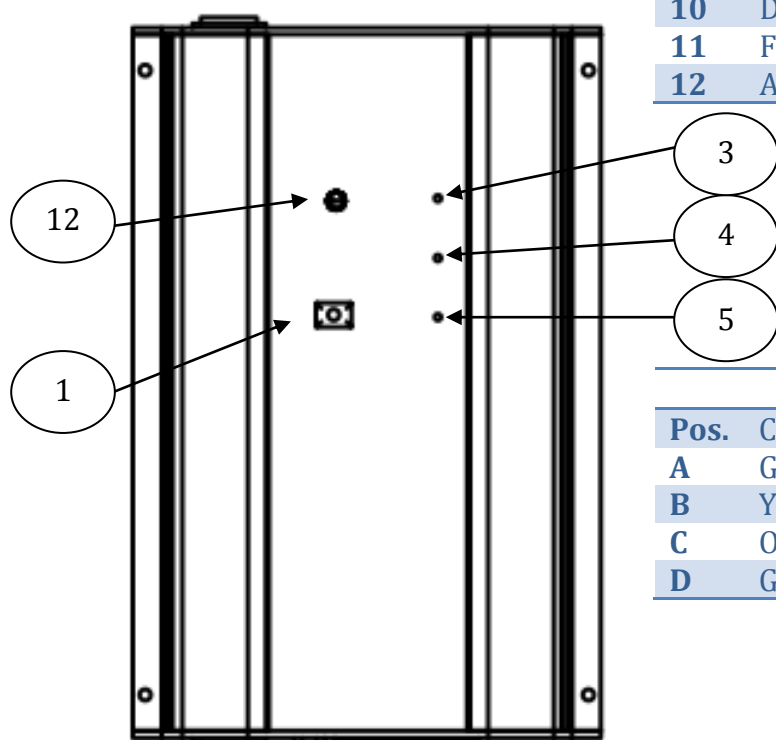
Always refer to the local safety standards in your country regarding electrical installations.

Device overview



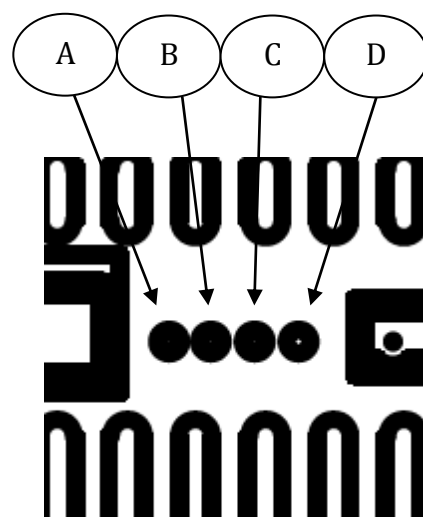
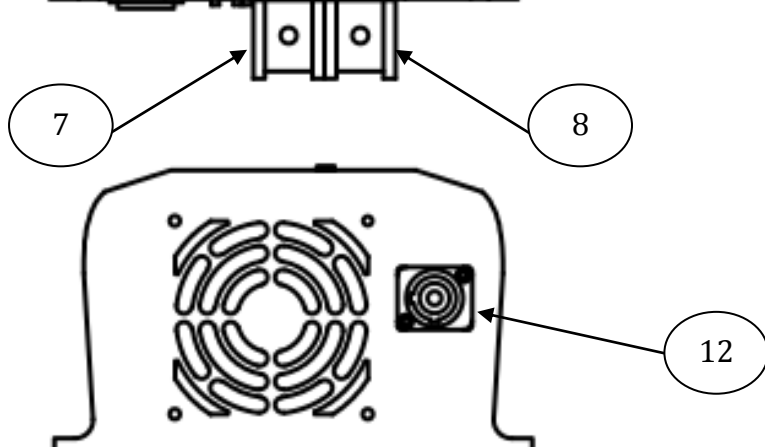
G3 Combi Layout

Pos.	Description
1	ON/OFF Power switch
2	Charge current adjustment (Ampere)
3	Charger active LED – Green
4	Inverter active LED – Blue
5	Battery LED – Red
6	AC charger input
7	Positive DC voltage terminal
8	Negative DC voltage terminal
9	Data and temperature sensor connector
10	Data and Remote connector
11	Fuse for AC input (10AT, 32mm x Ø6,3mm)
12	AC output



G3 Combi LED functions

Pos.	Color	Description
A	Green	Data link “High”
B	Yellow	Data link “low”
C	Orange	Remote active
D	Green	Not used



Installation

The Combi/Inverter is IP21 rated and should be mounted in a dry and dust free location.

Avoid mounting the device next to flammable materials.

The device can be mounted vertically or horizontal by using the 4x Ø5mm holes.

It is important that the airflow to and from the device is not obstructed to insure proper cooling of the device.

Optimum cooling is achieved by mounting the device vertically with the DC terminals pointing down.

DC Cables

The table below lists the recommended cable cross section and its recommended maximum length for each device model.

Note: If using cables longer than 3 meters it is advisable to oversize the DC cables. It is necessary to insure the cables are placed close together.

Note: The cable length is defined as the length between the battery and the Combi/Inverter.

mm ²	AWG	1012(-50)	1312(-80)	1512(-80)	2012(-100)	1024(-30)	1524(-40)	2324(-50)
15	5	-	-	-	-	1,5 m	-	-
25	3	1,5 m	-	-	-	2,5 m	1,5 m	-
35	2	2 m	1,5 m	1,5 m	-	3 m	2,5 m	1,5 m
50	1/0	3 m	2,5 m	2,5 m	1,5 m	-	3 m	2 m
70	2/0	-	3 m	3 m	2 m	-	-	3 m

Table 1 Recommended DC cable length and cross section

The following table shows the recommended torque the cables must be connected with to ensure a good connection to the DC terminals

Screw	Torque
M8	12Nm

Warning: Connecting the device with incorrect voltage or battery polarity will damage the device and is not covered by the warranty.

Note: When connecting the last DC cable to the device a spark will occur. This is normal and is caused from the internal DC filter capacitors being charged.

It is advisable to avoid sparks near the battery.

AC Mains Cables

Note: When installing AC cables, always refer to the local safety standards in your country!

The table below gives the recommended minimum wire cross sections for the AC mains cables.

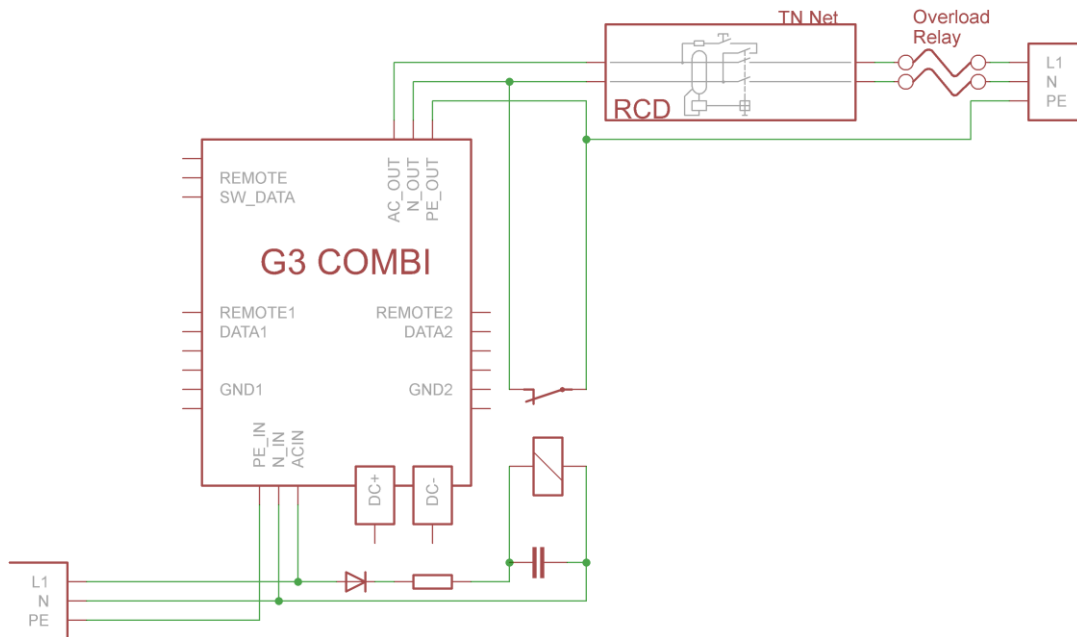
	1012(-50)	1312(-80)	1512(-80)	2012(-100)	1024(-30)	1524(-40)	2324(-50)
mm ²	1 mm ²	1 mm ²	1 mm ²	1,5 mm ²	1 mm ²	1 mm ²	1,5 mm ²
AWG	17 AWG	17 AWG	17 AWG	15 AWG	17 AWG	17 AWG	15 AWG

Table 2 Recommended minimum AC cross section.

Warning: Do not connect the AC outputs in parallel or serial. It will damage the device and is not covered by the warranty.

Warning: Do not connect a generator or AC mains to the output (gray neutrik). It will damage the device and is not covered by the warranty.

Note: Using RCD devices is highly recommended in any installation. The schematic below shows a recommended installation of an RCD.



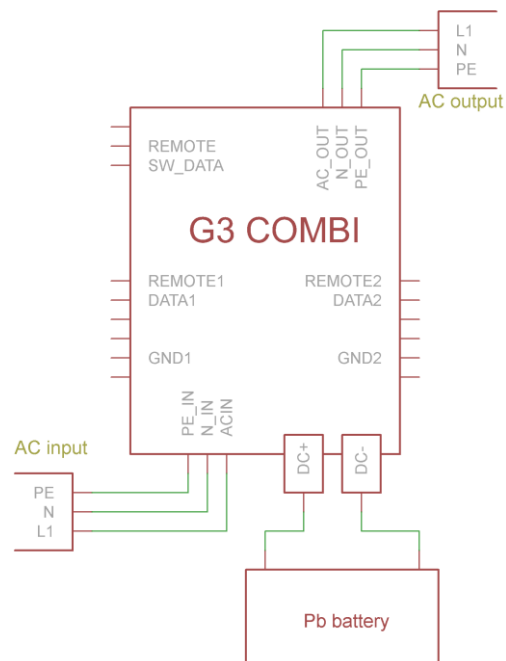
Operation

This section describes the three different modes of operation.

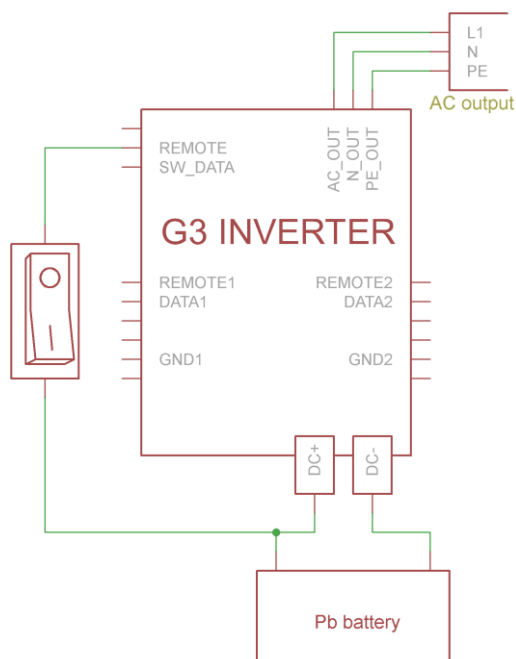
- Inverter mode.
Energy is taken from the battery and converted to 230 Vac and delivered at the output (grey Neutrik).
- Charger mode (Combi only).
Energy is taken from the AC input (blue Neutrik) and passed directly through to the output. Part of the energy is converted to DC and used to recharge the battery.
- Backup mode (Combi only).
If the device is charging from the AC input, and the inverter mode has been activated, and the 230 Vac is removed, the Combi will switch to inverter mode.

Inverter mode

The bare minimum setup is shown in the schematic below illustrated with a G3 Combi.



The device can also be activated by placing a voltage on the remote pin of one of the three connectors on the front of the device. This is illustrated in the schematic below.



If the device is connected to a Clayton Power Lithium battery with data the inverter will by default start when the battery is activated. To change this behavior, please refer to the Clayton Power Lithium Battery User Manual.

Note: if the battery is discharged the red LED will continue to light. Recharge the battery and try again.

Inverter Load Search Mode

The inverter can be put into load search mode to lower the standby power consumption. When the inverter is in load search mode, the inverter will automatically shut down when the AC load is lower than 10 W. The inverter will turn on every 2 seconds and detect if a load is present.

Press duration	Precondition	Function
2 seconds	Inverter mode is Off	Turn on inverter mode
1 second	Inverter mode is On	Turn off inverter mode
10 seconds	Inverter mode is Off and not in load search mode	Unit enters load search mode All LEDs lights solid
10 seconds	Inverter mode is Off and not in load search mode	Unit exits load search mode All LEDs blink

Note: When using the device with a Clayton Power Lithium battery it is not advised to use load search mode.

Charger mode

Activate the charger by applying 230 Vac to the AC input.

	Minimum voltage	Maximum voltage
Normal voltage range	185 Vac	265 Vac
Extended voltage range*	110 Vac	265 Vac

* The extended range is available if the inverter mode is not active. In the extended range the device will charge with reduced current (10A).

The charge is a fully automatic 3-stage charger with IUoUo characteristic.

Charge current adjustment

It is possible to reduce the charge current by adjusting the charge current potentiometer (2).

Note: the scale is in amperes out of the DC terminals, thus if adjusting e.g. a 1012-50 unit, the adjustment will have no effect from 50 – 100.

Automatic charge current reduction

The device output is rated for 2300 W when AC is present on the input for all the Combi devices. If the load power + maximum charging power exceed 2300 W, the charger will reduce the charge current to maintain a maximum of 2300 W from the input.

Charge LED

When the charger is charging the green LED has the following meanings:

- Green LED flashes fast: The charger delivers full charge current (with respect to charge current adjustment) and is in constant current mode.
- Green LED flashes slowly: The charger is reducing the current and maintaining a constant voltage.
- Green LED lights continuously: The battery is fully charged.

Recommended charge current setting

When using a Combi with a lead acid battery the following table shows the recommended maximum charge current compared with the battery capacity.

Charge current	Battery capacity
15 A	50 – 150 Ah
20 A	60 – 200 Ah
25 A	80 – 250 Ah
30 A	100 – 300 Ah
40 A	135 – 400 Ah
50 A	165 – 500 Ah
60 A	200 – 600 Ah
80 A	260 – 800 Ah
100 A	330 – 1000 Ah

Table 3 Recommended charge current compared to battery capacity

Attention:

- **If a sealed lead-acid battery is overcharged it will result in gassing and drying out. This may damage the battery.**
- **Wet batteries (open type) will lose water and need be refilled**
- **If you are in doubt how your battery should be charged please consult your battery technical document or your battery distributor.**

Temperature compensation (NTC sensor)

When using the external temperature sensor (NTC) the charger will reduce the charge voltage with respect to the maximum allowed battery voltage at the actual battery temperature. The temperature sensor shall be mounted at a point on the battery with good thermal contact.

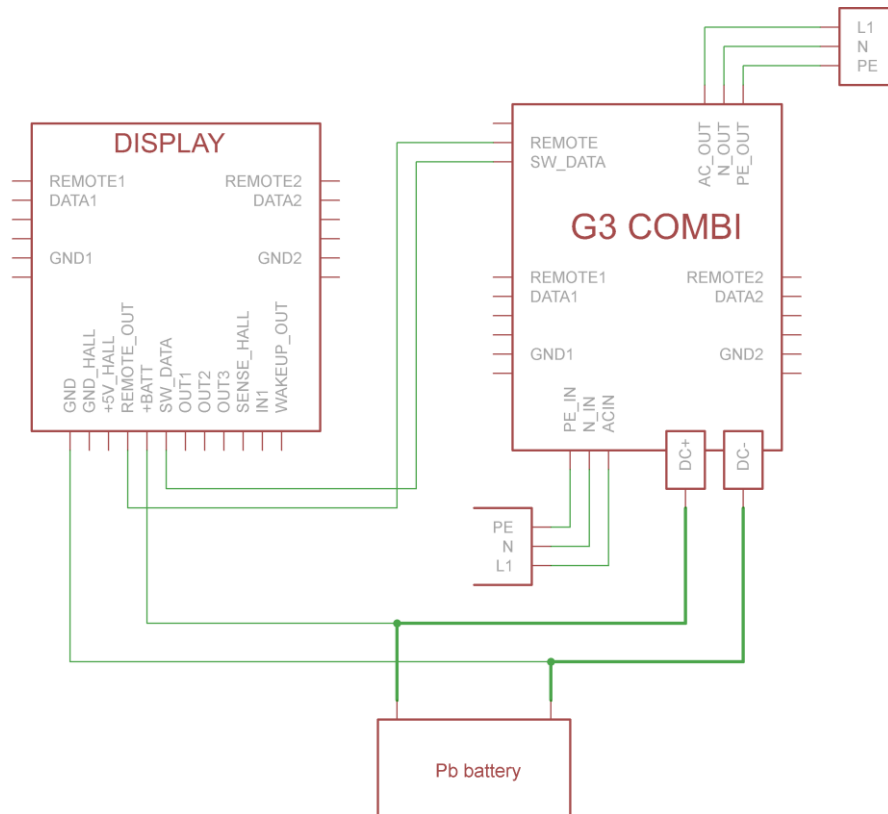
Use the temperature sensor for optimal battery performance when using lead acid batteries. When using Clayton Power Lithium batteries the temperature sensor is not needed.

G3 Display

It is possible to connect a Clayton Power G3 Display/Remote to visually get information about the device.

The Display can also be used to control the operation of the device. The schematic below shows a setup where the display is able to start and stop the device with the remote pin.

To get more information about the Display/Remote please refer the Clayton Power G3 Display User Manual.



LED code pattern description

The following tables describe the meaning of the different LEDs

The blue LED is for the inverter section

The green LED is for the charger section

The red LED is indicating the status of the battery.

Two or all of the LEDs can flash at the same time

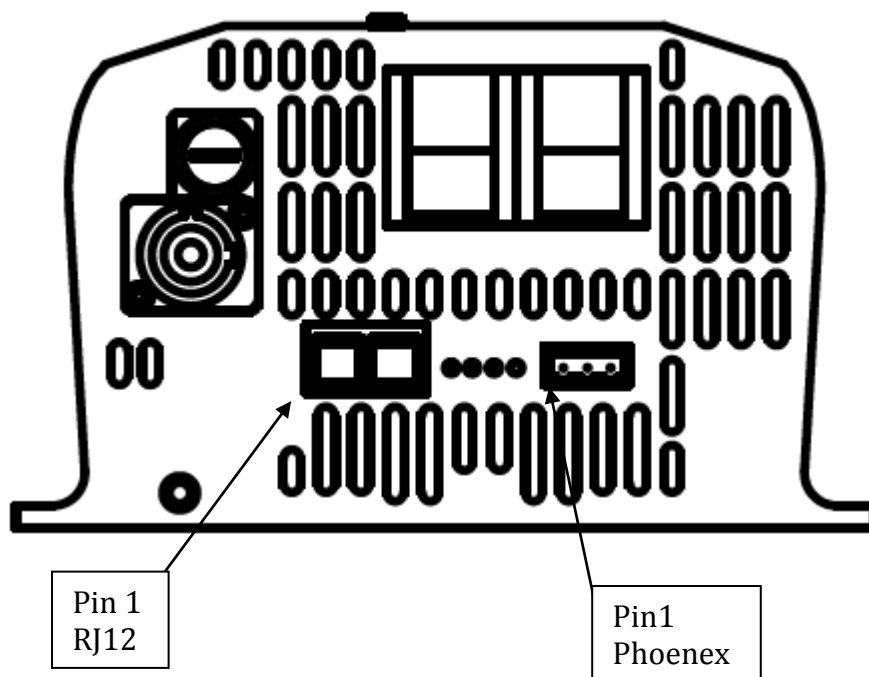
Blue LED	Description
ON	Inverter is activated
1 short flash every 2 seconds	Load search mode (Inverter mode ready)
1 flash	Inverter output is overloaded
2 flash	Internal temperature is too high (automatic cooling and restart)
3 flash	Short circuit at inverter output
4 flash	Short circuit in internal power supply
5 flash	Overload in power supply during startup

Green LED	Description
ON	Battery fully charged – float charging
Slow flashing (approximately 1Hz)	Charger is in top charging (boost voltage)
Fast flashing (approximately 2Hz)	Charger is boost charging
1 flash	AC input present but too low
2 flash	AC input present but too high

Red LED	Description
No light	Battery OK
ON	Battery voltage too low
Flashing	Battery voltage too high

All LEDs simultaneously	Description
4 flash	External temperature sensor not detected

Data connections



The connectors in position 9 and 10 are a RJ12 of type 6P6 connector.

Pin #	Signal	Description
1	-TempX	Negative connection for NTC temperature sensor
2	User GND	User ground (fused)
3	+TempX	Positive connection for NTC temperature sensor
4	Not Used	Do not connect
5	DATA	Clayon Power Single Wire communication
6	Remote	If connected to positive battery voltage, it will switch on the G3 Combi If left open, it will have no influence

The connector in position 11 is a Phoenix Combicon MSTB 2.5 / 3-ST-5.08

Pin #	Signal	Description
1	DATA	Clayon Power Single Wire communication
2	Remote	If connected to positive battery voltage, it will switch on the G3 Combi If left open, it will have no influence
3	Not Used	Do not connect

The two signals DATA and Remote are internally connected.

Technical specification

Inverter

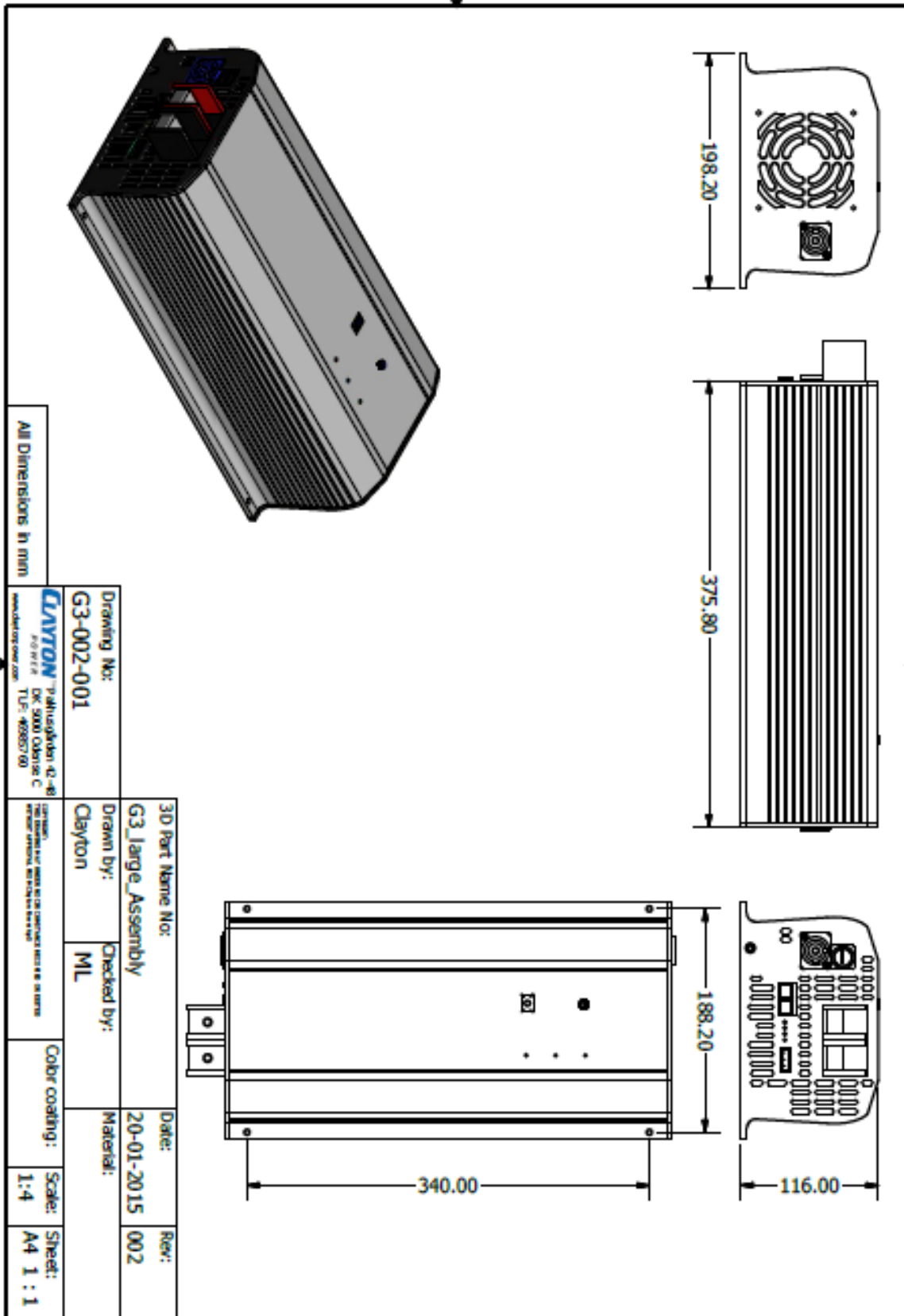
Model	1012	1312	1512	2012	1024	1524	2324	2336
Power rating								
Continues output power	1000W	1300W	1500W	2000W	1000W	1500W	2300W	2300W
Output power surge (1 sec)	2000W	3000W	3000W	4000W	2000W	3000W	4000W	4000W
Output power surge (10 sec)	1500W	1800W	2000W	2800W	1500W	1800W	3000W	3000W
Output power surge (15 min)	1200W	1500W	1700W	2200W	1200W	1700W	2500W	2500W
Max efficiency	90%	92%	90%	90%	93%	93%	92%	92%
Self Power Consumption								
No load	10W	10W	15W	15W	10W	10W	15W	17W
Load search mode					<3W			
Sleep mode					<8mA			
Thermal Management								
Max operating temperature					50°C			
Min operating temperature					-20°C			
Max internal temperature					80°C			
Voltage out								
Nominal output voltage					230 VAC			
Output voltage tolerance					-10% , +5%			
Frequency					50 Hz			
Waveform					Sine			
THD Max.					3%			
DC Voltage								
Battery input voltage (nominal)			12 VDC				24 VDC	
Max battery input voltage			15 VDC				30 VDC	
Low battery cutoff (slow reaction 3 sec)			10,5 VDC				21 VDC	
Low battery cutoff (fast reaction <10 ms)			9 VDC				18 VDC	
Voltage before inverter can switch on again after low battery cutoff			12,75 VDC				25,5 VDC	
							38,25 VDC	

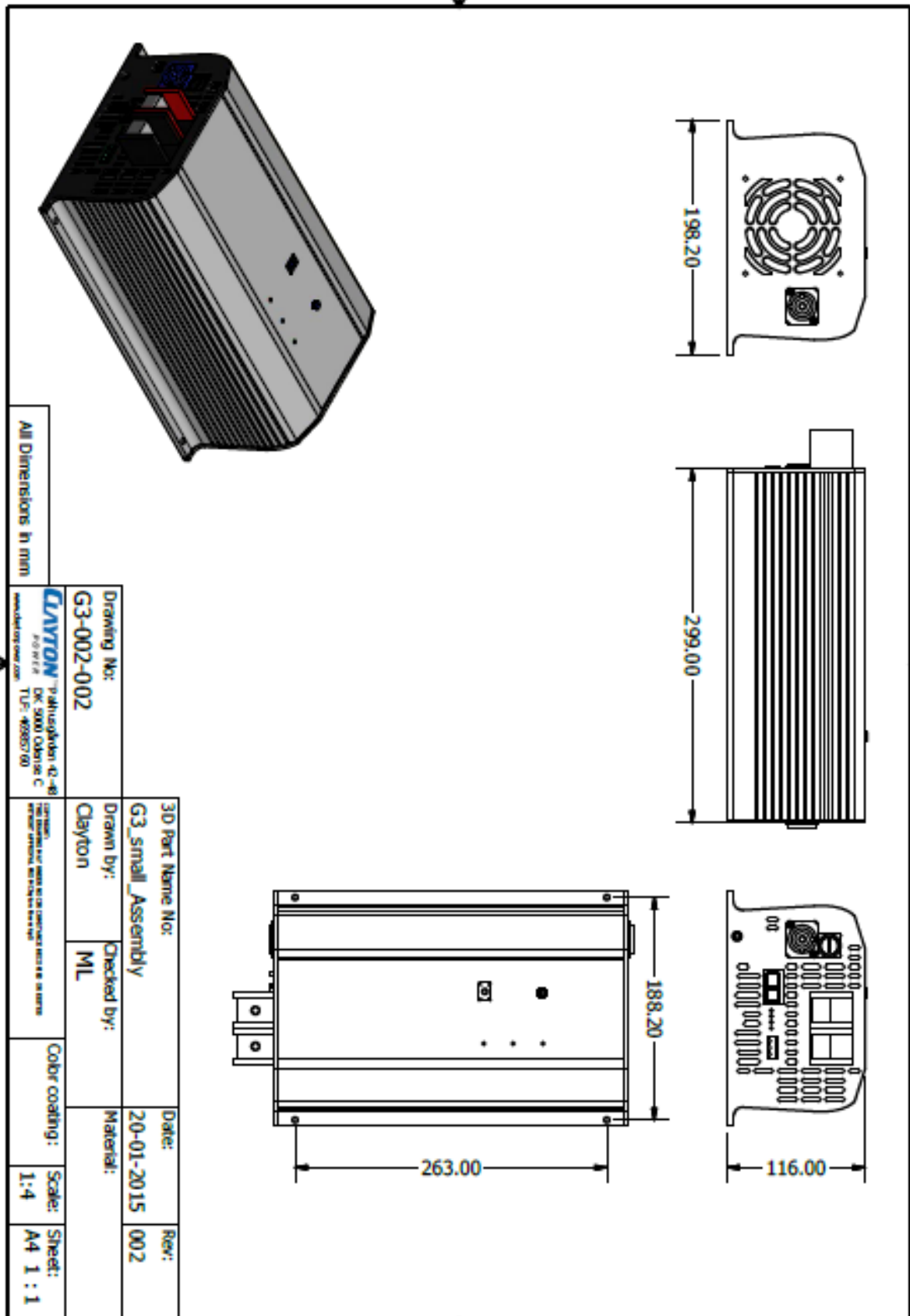
Charger

Model	1012-50	1312-80	1512-80	2012-100	1024-30	1524-40	2324-50
Battery							
Battery Types	Open, Sealed Lead Acid and Clayton Power Lithium Ion						
Charge characteristics	IUoUo						
Battery Temperature sensor	Yes (Optional)						
Charge Current							
Max Charge current (adjustable)	0 – 50 A	0 – 80 A	0 – 80 A	0 – 100 A	0 – 30 A	0 – 40 A	0 – 50 A
Charge Current reduction @ 50°C (% of max current)	0 %						
Charge Current reduction @ 60°C (% of max current)	15 %						
Charge Current reduction @ 80°C (% of max current)	50 %						
Charge Voltage							
Boost charge voltage	14,4 VDC					28,8 VDC	
Float charge voltage	13,5 VDC					27 VDC	
Input Mains							
AC Input voltage Max				265 VAC			
AC input voltage min (full charge current)				185 VAC			
AC input voltage min (reduced charge current)				110 VAC			
AC inrush current (max)				50 A			
Power consumption (max)	1000	1500	1500	1900	1200	1500	1900
Frequency				45 Hz – 65 Hz			
Power factor				0,9			
Max efficiency				90 %			
Bypass Current							
AC input to AC output (max)				10 A			
Fuse Rating							
Fuse type				10AT			

Mechanical

Model	1012-50	1312-80	1512-80	2012-100	1024-30	1524-40	2324-50
Weight	7,5 kg	7,5 kg	9,5 kg	9,5 kg	7,5 kg	7,5 kg	9,5 kg
Dimensions (W x L x H)	198 x 336 x 118	198 x 336 x 118	198 x 414 x 118	198 x 414 x 118	198 x 336 x 118	198 x 336 x 118	198 x 414 x 118
Package dimensions (W x L x H)	275 X 460 X 260	275 X 460 X 260	275 X 535 X 260	275 X 535 X 260	275 X 460 X 260	275 X 460 X 260	275 X 535 X 260
Package weight	8,6 kg	8,6 kg	10,5 kg	10,5 kg	8,6 kg	8,6 kg	10,5 kg





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